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U.S. Army Toxic and Hazardous Materials Agency

Report of Sampling and Analysis Results



Swansea Army Housing Units
Swansea, Massachusetts

August 1990

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U.S. Army Toxic and Hazardous Materials Agency
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**SAMPLING AND ANALYSIS AT THE U.S. ARMY
FAMILY HOUSING UNIT (FHU) PROPERTY
SWANSEA, MASSACHUSETTS**

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EXECUTIVE SUMMARY

The U.S. Army family housing units (FHUs) at Swansea, Massachusetts were inspected by Roy F. Weston, Inc. (WESTON) personnel during February 1990 to further evaluate the environmental concerns identified in the enhanced Preliminary Assessment reports prepared and submitted earlier by Argonne National Laboratory (ANL) for the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). Three of the 16 single-family "Capehart" housing units were examined on 08 February to investigate the possible presence of asbestos-containing materials (ACM). An assessment of airborne asbestos exposure was performed at one unit on this property on 20 April 1990 by a WESTON Certified Industrial Hygienist (CIH), because asbestos fibers were detected in the dust deposited within the ductwork of the heating system.

The ANL Draft Sampling and Analysis Plan, Revision 1 (SAP) specified sampling the following materials, where present, which are suspected to contain asbestos, from ten per cent of the housing units or a minimum of three housing units, whichever is greater.

- Pipe run insulation.
- Dust accumulated inside heating ductwork within the concrete slab, where present and open.
- Vinyl floor tiles.

The WESTON personnel selected three housing units for inspection after review of maintenance records and drawings, discussions with housing management personnel, and determination that the units were in similar condition. The housing units chosen, Nos. 013, 014, and 015, were considered to be representative of the other 13 units, but this was not confirmed by an examination of all the units.

Nine dust samples, 11 samples of floor tile, and four samples of pipe run insulation were collected by WESTON and analyzed. These analyses revealed that asbestos is present in dust accumulated within the heating ductwork, in floor tile, and in pipe run insulation at the three housing units examined. Asbestos was found in all nine of the dust samples by transmission electron microscopy (TEM) and in at least two samples from each unit. Asbestos was quantified at 1% or greater by polarized light microscopy (PLM) in eight of the floor tile samples, and was qualitatively identified in two other samples by TEM. Asbestos was found at 20% in one of the four pipe run insulation samples by PLM. During the asbestos sampling activity, other suspect materials observed were roof shingles and felt.

The following practices should be observed with regard to the known and suspected asbestos-containing materials identified:

- The most significant risk of asbestos exposure to occupants is presented by the friable asbestos-containing pipe run insulation. All damaged material should be repaired or removed in a planned, properly executed program, as soon as practical. If repairs are made, rather than removal, an Operations and Maintenance (O&M) Plan should be developed and implemented. This plan must describe the locations of all known ACM, procedures for its maintenance, repair and removal, and personnel responsible for its implementation. The O&M program must remain in force until such time as all ACM is removed from the facility.

- The risks posed by the asbestos-containing dust in the ductwork cannot be clearly evaluated, because the sampling and analysis program only included a qualitative screening of this material since no approved quantitative procedure exists. Further studies, such as air sampling, were recommended to determine if the asbestos is becoming airborne and to define what risks, if any, are presented by these findings. These studies were subsequently performed and the findings are presented in this report.
- The vinyl floor tiles pose no significant risk as long as they are in good condition and are not damaged by excessive wear or misuse. They should be managed in place under an O&M program which describes procedures for the regular inspection of the floor coverings and the removal and replacement of any that become damaged.
- Other suspect materials identified but not sampled, including roofing shingles and felt, should be assumed to contain asbestos and managed in place under an O&M program until they are either removed or determined to contain no asbestos.

Samples for airborne asbestos were collected from four floor vents, one located in each of the living room, kitchen, bedroom, and bathroom, in an unoccupied unit which had been inspected previously. However, the vent in the kitchen had not been sampled during that study so a dust sample was collected from this vent and analyzed. The air samples were subjected to analysis by TEM to identify and quantify any asbestos fibers collected.

No asbestos fibers were found in any of the samples from this house. The sample volumes collected resulted in detection limits for airborne asbestos fiber concentration of <0.005 fibers per cubic centimeter (f/cc), which does not pose a substantial risk to occupants. The sampling procedures employed were designed to simulate the worst-case concentration that is likely to be encountered. Chrysotile fibers were detected in the dust sample collected from the kitchen duct during this follow-up study, as well as in the three samples collected previously.



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SECTION 1. INTRODUCTION

**SAMPLING AND ANALYSIS AT THE U.S. ARMY
FAMILY HOUSING UNIT (FHU) PROPERTY
SWANSEA, MASSACHUSETTS**

SECTION 1. INTRODUCTION

Roy F. Weston, Inc. (WESTON) was retained by Argonne National Laboratory (ANL) to provide assistance in gathering additional environmental data for the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) at 53 family housing unit (FHU) properties in 12 states. The Swansea, Massachusetts property is one of these FHUs.

1.1 PURPOSE AND SCOPE

The purpose of this project was to provide the Department of the Army with sound environmental data on the properties which are scheduled for sale or realignment as a result of the Defense Authorization Amendments and Base Closure and Realignment Act (Public Law 100-526). Environmental assessments of each property covered by the Act are required by the Secretary of Defense prior to their closure or realignment. Such actions must be performed in accordance with applicable provisions of the National Environmental Policy Act (NEPA) to ensure that any environmental hazards will be identified and mitigated where required.

Previously, ANL conducted enhanced preliminary assessments (PAs) for each property. These enhanced PAs made recommendations regarding sampling and analysis to determine (1) whether and in what quantities asbestos is present in certain building construction materials (including pipe run insulation, dust accumulated in heating ductwork, vinyl floor tile, and exterior siding shingles, where present), (2) in selected contexts, whether and in what concentration soils and groundwater may be contaminated, and (3) whether and in what range transformer oils at selected sites may contain polychlorinated biphenyls (PCBs). WESTON gathered this data by implementing ANL's Draft FHU Sampling and Analysis Plan, Revision 1 (SAP). Subsequent to the initial studies, WESTON, ANL, and USATHAMA decided that a follow-up effort was required to determine if asbestos fibers were becoming airborne from the dust in the heating system. This study was implemented, and samples were collected to evaluate any risks to occupants from this source.

1.2 SITE DESCRIPTION

The Department of the Army's FHU property in Swansea, Massachusetts consists of 16 single-family housing units located on 4.79 acres. The units are situated along Missile Loop Road. The areas surrounding this FHU facility are residential properties to the north and south, with wooded areas to the east and west.

The three-bedroom "Capehart"-style single-family housing units were constructed in 1958. The single-story, wood-frame units were built on concrete slab foundations with no basements or crawl spaces. The ducts for the original heating system and domestic water lines were embedded in the concrete slab, which was covered with vinyl floor tile. The units have pitched roofs surfaced with asphalt shingles and exteriors finished with vinyl siding.

1.3 REPORT ORGANIZATION

This report contains the results of the sampling and analysis program performed by WESTON. Section 2 contains a description of the asbestos sampling performed at the property and laboratory results for samples of suspected asbestos-containing material (ACM) collected. Copies of field notes and laboratory results pertaining to asbestos are provided in Appendices A.1 and A.2. Section 3 presents a description of the field sampling activities and results of the analyses for airborne asbestos fibers. Field notes and copies of the laboratory reports for this effort are presented in Appendices B.1 and B.2, respectively. Section 4 is a summation of all activities and findings for Swansea.

SECTION 2. ASBESTOS-CONTAINING MATERIALS

SECTION 2. ASBESTOS-CONTAINING MATERIALS

WESTON personnel inspected three of the 16 "Capelhart" units at the Swansea family housing facility on 08 February 1990 for the presence of suspected ACM. Vinyl floor tile, pipe run insulation, and dust accumulated within the heating ductwork were the only suspect materials found within the buildings that were sampled. All sampling was done following the requirements of ANL's SAP. Additionally, all field work was performed in accordance with applicable Federal regulations, including 40 CFR Part 61 Subpart M, 40 CFR Part 763 Subpart E, and 29 CFR Part 1910.1001.

2.1 SAMPLING RATIONALE

The sampling rationale used by WESTON for this project followed the recommendations set forth by ANL. The type of suspect ACM to be sampled, the number of housing units to be examined at each FHU facility, and number of samples to be taken for each material found were described in the SAP. The plan for Swansea required sampling of the following materials, if present:

- Pipe run insulation.
- Accumulated dust inside heating ductwork if not sealed.
- Vinyl floor tiles.

In accordance with the SAP, three units were examined at this facility. The sampling plan, however, did not identify specific units which were to be sampled. The task of determining which housing units were representative of the facility as a whole and, therefore, would be sampled was left to the WESTON field team. After reviewing all available maintenance records and drawings and discussing the facility with Directorate of Engineering and Housing (DEH) personnel, it was determined that all of the units at the Swansea FHU were similar in condition. Units 013, 014, and 015 were chosen by the WESTON field team leader as representative units to be sampled.

The SAP specifies that a minimum of two pipe run insulation samples, four dust samples, and one sample of each color of floor tile be collected from each of the housing units examined. Nine dust samples, four pipe run insulation samples, and 11 samples of vinyl floor tiles were collected at the facility. Dust samples could not be collected from the kitchen vents because they were sealed. The pipes in one unit examined contained no insulation.

2.2 FIELD ACTIVITIES AND OBSERVATIONS

Each of the units was inspected to determine if suspect materials were present. The samples of the pipe fitting insulation were retrieved using a disposable coring device with a one-half inch diameter tube, designed such that the coring device also serves as the sampling containers. Before the coring tool was inserted, the materials to be sampled were moistened to prevent asbestos fibers from becoming airborne. The coring device was placed in its outer sample container and secured by a tight fitting lid. The containers were labeled with sample numbers, and shipped to the lab. The sampling tools were wiped clean with a damp cloth and all debris resulting from the sampling activities as collected and placed into plastic bags. The small bore hole was sealed with an encapsulant.

Two samples of pipe fitting insulation were taken in each of the two units. The pipes in the other unit were not insulated. The pipe run insulation is friable, as defined in the EPA regulations, meaning that it can be crushed, crumbled, pulverized, or otherwise reduced to a powder using hand pressure. Friable ACM are considered to be more hazardous than non-friable ACM since they are much more likely to release asbestos fibers. Because of its friability and instances of damage, the pipe run insulation is considered to be the most hazardous type of ACM in the Swansea FHU.

Heating ductwork vents in the units were not sealed, except in the kitchens, so dust samples were collected by wiping the inner surface of the duct near the designated exhaust vents with a fiber-free wipe selected for its ability to trap dust in a non-fibrous matrix. Each wipe was placed in the jaws of a flexible small parts pick-up tool and moistened with fiber free water. The grille was then removed and the tool inserted into the duct opening. The interior surface was wiped to collect dust on the moistened surface of the wipe. After the dust was gathered, the wipe was placed in a small plastic wide-mouth jar, sealed, labeled with the sample number, and shipped to the lab. The grille was then replaced and the tool was cleaned by rinsing and wet wiping the surfaces prior to collecting the next sample. Samples were collected from the living room, bedroom, and main bathroom in all three units.

Five colors (gray, light brown, green, and two types of white) of 9" x 9" floor tile and one color (floral pattern) of 12" x 12" floor tile were sampled. All three units contained the floral pattern 12" x 12" floor tile and white 9" x 9" floor tile. In addition, Unit 13 contained both green and white 9" x 9" floor tile, Unit 14 contained gray 9" x 9" floor tile, and Unit 15 contained both white and light brown 9" x 9" floor tile. One sample of each of the floor tile types was taken in each housing unit, resulting in a total of 11 samples for laboratory determination of asbestos content. These samples were taken by breaking off a small piece of floor tile in an inconspicuous location. About one square inch of the tile surface area was taken for each sample. No effort was made to separate the mastic, which sometimes contains asbestos, from the floor tile samples themselves.

The vinyl floor tile in all three of the units inspected was in good condition. This material is considered to be a non-friable type of ACM, unless damaged. If significant damage occurs, such that the material becomes friable as defined in the asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP), the U. S. Environmental Protection Agency (EPA) would classify these tiles as friable materials. However, an EPA interpretation was recently released that changes certain previous interpretations regarding non-friable ACM. On 23 February 1990, a memorandum was issued by the Director of Emissions Standards Division, the Director of Stationary Source Compliance Division, and the Associate Enforcement Counsel for Air Enforcement of the EPA Office of Air Quality Planning and Standards (OAQPS). This memorandum was circulated to other air quality officials and EPA regional offices in early March 1990. This latest position states that floor tiles and certain other non-friable materials do not have to be removed from a facility prior to demolition, unless they are severely damaged and thus are considered friable, or unless the demolition may cause fiber release through grinding or abrasion of the tiles. Floor tile removal shall be done if demolition is to be accomplished by burning, either of the unit or of the debris from demolition. However, if the floors in the housing units are to be renovated, special care must be taken during the process to prevent the release of asbestos fibers.

The WESTON field team was directed, as a part of the project scope contained in the SAP, to perform sampling and analysis of specific suspect ACM. Other suspect materials observed were roof shingles and felt. Copies of the field notes are included in Appendix A.1.

2.3 LABORATORY PROCEDURES AND RESULTS

The bulk samples of building materials were analyzed for asbestos content by WESTON's optical microscopy laboratory in Auburn, Alabama. This laboratory is accredited by the American Industrial Hygiene Association (AIHA) and the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP). The bulk samples were analyzed by Polarized Light Microscopy (PLM) using the EPA's "Interim Method for the Determination of Asbestos in Bulk Insulation Samples", EPA 600/M4-82-020, December 1982. Copies of the laboratory reports are included in Appendix A.2.

Vinyl floor tile samples for which no asbestos was found using PLM methods and wipe samples of dust accumulated within heating ductwork were analyzed qualitatively for the presence of asbestos by Transmission Electron Microscopy (TEM) at WESTON's NVLAP accredited electron microscopy laboratory in Auburn, Alabama. Copies of these laboratory reports are also included in Appendix A.2.

All analyses were performed in accordance with protocols set forth in the Laboratory Accreditation package submitted by WESTON under NVLAP. This document includes standard procedures for sample analysis and quality assurance / quality control (QA/QC) which were acceptable to NIST. The QA/QC protocols for the laboratory differ significantly from those commonly found in chemical analysis procedures, due to the nature of the analytical procedure. Since there are no reagents, digestions, or other steps in the process that provide significant opportunities for sample contamination or analyte loss, lot blanks and sample spikes are not performed. Instead, all analyses are performed using the following steps:

- Incoming samples are divided into lots of ten for analysis.
- One sample is selected at random to serve as the QC check and divided into two containers.
- The sample lot is assigned to an analyst who determines the asbestos content of each sample.
- The QC sample is analyzed by a different analyst, designated by the sample custodian.
- The results of both analysts are submitted to the QC Coordinator for review, and comparison to the laboratory QC chart.
- The results are reviewed and approved, based on the written QC review procedures, or rejected. If rejected, the sample lot and QC sample are reanalyzed.

The WESTON laboratory routinely runs blank checks to ensure that equipment and refractive index oils are not contaminated, collects and analyzes samples of the air in the work areas to document that airborne asbestos fibers do not threaten worker health or contaminate samples, and analyzes samples submitted by NIST to document precision of results as required by the NVLAP program. Samples provided in past rounds of proficiency checks are used for analyst training and to document analyst proficiency. The use of third party laboratory comparisons is often done, and is accomplished by sending duplicates of samples to an outside laboratory and comparing the results obtained by the two facilities.

In interpreting the asbestos results, it should be noted that the definition of asbestos presence differs between the EPA and some state agencies. According to the EPA definition, any materials that contain greater than one per cent (>1%) asbestos are classified as ACM by the 1977 NESHAP regulations. However, California has recently implemented state regulations that consider all materials containing 0.1 per cent or more asbestos as asbestos-containing. It is believed that several other states will soon follow the lead of California in lowering the threshold limit to 0.1 per cent, including some in which properties under review in this study are located. Currently the State of Massachusetts continues to abide by the EPA definition, hence, all samples containing >1% asbestos are considered to be ACM.

The matter is further complicated by the fact that the PLM method was developed specifically for friable materials, but not for non-friable types of suspect ACM such as vinyl floor tiles, vinyl sheeting, and siding. In fact, no specific method has been developed and promulgated to date for such samples, so laboratories use PLM as the only available documented procedure for their analysis. PLM has an inherent limitation on fiber resolution of about 0.25 micrometer (um) in diameter, while reliable detection and quantification of fibers smaller than 1 um in diameter is difficult. The manufacturing process for vinyl floor tiles, for example, often produces the very small fiber diameters which cannot be seen by PLM. WESTON's experience is that frequently such samples do, in fact, contain significant quantities of asbestos. WESTON has developed a qualitative technique using TEM to detect the presence of such small fibers and minimize false negatives in the laboratory results. This technique, however, does not allow a good quantitative estimate of asbestos content.

For these reasons, the WESTON laboratories have implemented a policy of reporting asbestos presence as follows:

- Asbestos determined by PLM to be present at greater than 1% is reported as the quantity detected.
- If asbestos is estimated to be less than 1% by PLM, it is reported as "<1%". This estimate of asbestos content may be made when only one asbestos structure is observed.
- If asbestos is not detected in certain non-friable materials by PLM, then the samples are subjected to TEM analysis. The results are reported as positive if asbestos is detected by TEM.

Recommendations made in this report are based on the >1% regulatory limit, except for floor tiles as discussed earlier and except as otherwise noted. However, all samples in which asbestos was detected are discussed. This represents a conservative approach to the assessment of asbestos presence at the facility.

Table 2.1 contains a summary of all samples collected at the Swansea FHU, including sample locations, material descriptions, and laboratory results. PLM results are quantitative while TEM results are qualitative. Quantity estimates for materials sampled that were suspected to contain asbestos are presented in Table 2.2. The field notes describing the observations are provided in Appendix A.1, while copies of the original laboratory reports are included as Appendix A.2.

TABLE 2.1
BULK SAMPLE SUMMARY
SWANSEA FAMILY HOUSING

SAMPLE IDENTIFICATION	MATERIAL TYPE	LOCATION	ASBESTOS CONTENT PLM ANALYSIS	CONFIRMATION TEM ANALYSIS
=====				
Unit 014				

AP482-18-MA-014-ATD	Dust in ductwork	Dining room	---	Positive
AP483-18-MA-014-ATD	Dust in ductwork	Bath	---	Positive
AP484-18-MA-014-ATD	Dust in ductwork	Bedroom 1	---	Positive
AP485-18-MA-014-AFT	Gray 9" x 9" floor tile	Patch in bedroom 1	Chrysotile, 8%	
AP486-18-MA-014-AFT	Floral pattern 12" x 12" floor tile	Kitchen	None Detected	Positive
AP487-18-MA-014-AFT	White 9" x 9" floor tile	All rooms except kitchen	Chrysotile, 1%	
Unit 015				

AP488-18-MA-015-API	Pipe run insulation	Heating room	None Detected	
AP489-18-MA-015-API	Pipe run insulation	Heating room	Chrysotile, 20%	
AP490-18-MA-015-AFT	Lt Brown 9" x 9" floor tile	Patch in bedroom 1	Chrysotile, 8%	
AP491-18-MA-015-AFT	White 9" x 9" floor tile	Patch in bedroom 1	Chrysotile, 10%	
AP492-18-MA-015-AFT	White 9" x 9" floor tile	All rooms except kitchen	Chrysotile, 3%	
AP493-18-MA-015-AFT	Floral pattern 12" x 12" floor tile	Kitchen	None Detected	Negative
AP494-18-MA-015-ATD	Dust in ductwork	Living room	---	Positive
AP495-18-MA-015-ATD	Dust in ductwork	Bath	---	Positive
AP496-18-MA-015-ATD	Dust in ductwork	Bedroom 2	---	Positive
Unit 013				

AP497-18-MA-013-API	Pipe run insulation	Heating room	None Detected	
AP498-18-MA-013-API	Pipe run insulation	Heating room	None Detected	
AP499-18-MA-013-ATD	Dust in ductwork	Living room	---	Positive
AP500-18-MA-013-ATD	Dust in ductwork	Bedroom 2	---	Positive
AP501-18-MA-013-ATD	Dust in ductwork	Bath	---	Positive
AP502-18-MA-013-AFT	White 9" x 9" floor tile	All rooms except kitchen	Chrysotile, 5%	
AP503-18-MA-013-AFT	Floral pattern 12" x 12" floor tile	Kitchen	None Detected	Positive
AP504-18-MA-013-AFT	Green 9" x 9" floor tile	Patch throughout unit	Chrysotile, 5%	
AP504-18-MA-013-AFT	White 9" x 9" floor tile	Patch throughout unit	Chrysotile, 3%	

TABLE 2.2
ASBESTOS CONTAINING MATERIALS
SWANSEA FAMILY HOUSING

SAMPLE IDENTIFICATION	MATERIAL TYPE	LOCATION	QUANTITY	UNITS
=====				
Unit 014				

AP482-18-MA-014-ATD	Dust in ductwork	Dining room	N/A	
AP483-18-MA-014-ATD	Dust in ductwork	Bath	N/A	
AP484-18-MA-014-ATD	Dust in ductwork	Bedroom 1	N/A	
AP485-18-MA-014-AFT	Gray 9" x 9" floor tile	Patch in bedroom 1	10	Square ft
AP486-18-MA-014-AFT	Floral pattern 12" x 12" floor tile	Kitchen	130	Square ft
AP487-18-MA-014-AFT	White 9" x 9" floor tile	All rooms except kitchen	1,306	Square ft
Unit 015				

AP489-18-MA-015-API	Pipe run insulation	Heating room	<1	
AP490-18-MA-015-AFT	Lt Brown 9" x 9" floor tile	Patch in bedroom 1	5	Square ft
AP491-18-MA-015-AFT	White 9" x 9" floor tile	Patch in bedroom 1	5	Square ft
AP492-18-MA-015-AFT	White 9" x 9" floor tile	All rooms except kitchen	1,306	Square ft
AP494-18-MA-015-ATD	Dust in ductwork	Living room	N/A	
AP495-18-MA-015-ATD	Dust in ductwork	Bath	N/A	
AP496-18-MA-015-ATD	Dust in ductwork	Bedroom 2	N/A	
Unit 013				

AP499-18-MA-013-ATD	Dust in ductwork	Living room	N/A	
AP500-18-MA-013-ATD	Dust in ductwork	Bedroom 2	N/A	
AP501-18-MA-013-ATD	Dust in ductwork	Bath	N/A	
AP502-18-MA-013-AFT	White 9" x 9" floor tile	All rooms except kitchen	1,306	Square ft
AP503-18-MA-013-AFT	Floral pattern 12" x 12" floor tile	Kitchen	130	Square ft
AP504-18-MA-013-AFT	Green 9" x 9" floor tile	Patch throughout unit	5	Square ft
AP504-18-MA-013-AFT	White 9" x 9" floor tile	Patch throughout unit	10	Square ft

One sample of pipe run insulation was found to contain the chrysotile type of asbestos in a friable form at a concentration of 20% using the PLM technique for analysis. No detectable asbestos fibers were found in three other samples by PLM. Based on these observations, the pipe run insulations should be considered to contain asbestos.

Eight of the floor tile samples were found by PLM to contain asbestos at or greater than the 1% level. WESTON considers the 1% value reported for sample AF-487-18-MA-014-AFT to be sufficient to define the samples as asbestos-containing, due to the analytical uncertainty of the PLM method when applied to floor tiles, previously discussed. Two of the samples, for which no asbestos was reported following PLM analysis, was found to contain asbestos fibers by the TEM procedure. While this result is qualitative in nature, consideration of the process through which floor tiles were manufactured leads to the conclusion that this material should be treated as ACM. No detectable asbestos fibers were found in one sample by both PLM and TEM. Thus, ten of the 11 floor tile samples were found to contain asbestos. The 13 units not inspected should be considered to have ACM present in the floor tiles unless additional sampling and analysis is performed and shows that no asbestos is present in these units.

Analytical results for the dust samples taken from the heater ductwork indicate that this dust contains some asbestos fibers. Qualitative TEM analyses revealed the presence of asbestos in all nine of the dust samples. At least two samples from each unit had detectable asbestos fibers. This data lead to the conclusion that asbestos is found in the dust trapped by the heating ducts.

2.4 CONCLUSIONS AND RECOMMENDATIONS

The sample analyses performed by WESTON have revealed that asbestos is present in most floor tile samples collected in the three housing units examined, in one pipe run insulation sample, and that the dust inside the heater supply ducts contains asbestos. These units are thought to be representative of the other 13 at the site, but this was not confirmed by sampling all units.

Analytical results of the pipe run insulation confirmed that asbestos is present in one of the samples taken. The insulation should be remediated in those units where asbestos-containing pipe run insulation is damaged by repairing damaged areas and encapsulating the friable materials, or by complete removal. If repairs are made, rather than removal, an Operations and Maintenance (O&M) Plan should be developed and implemented. An O&M plan must address the following:

- The locations of all known and suspected ACM.
- The procedures and frequency for periodically assessing the ACM in the facility.
- The procedures for safely handling the ACM during maintenance or removal activities.
- Designation of an asbestos coordinator for the facility.
- The responsibilities and requirements for training of personnel involved with maintenance and renovation of the facility.
- The record-keeping program for the facility.

All of the asbestos-containing pipe run insulation must be removed prior to a planned renovation of the plumbing system or demolition of the units.

The asbestos dust accumulated within the heating ductwork represents an unusual problem, since the source of this asbestos is not readily apparent, and the quantity is not precisely known. As a conservative approach, the heating ductwork located within the concrete slab should be cleaned or permanently sealed when the units are renovated. Since the heating systems are currently operational, sealing the floor vents will require replacement with attic ducts and ceiling vents, or provisions of an alternate heating source. If the ducts are cleaned, a high-powered vacuum cleaner equipped with a high-efficiency particulate air (HEPA) filter should be employed, since other vacuum cleaners are not capable of trapping all of the small asbestos fibers that may be present.

The source of the asbestos in the ducts cannot be positively determined, due to the sampling and analysis procedures employed. However, there are several potential sources, based on observations at the numerous facilities inspected during this project. Units, presumed to be the original heaters, found at other facilities frequently contained an expansion joint which served to isolate the return air plenum from the heater itself, preventing the transmission of vibrations and noise to the ductwork. The fabric-like material used to form this joint was determined, in some cases, to be chrysotile asbestos in a nearly pure form. It is possible, even likely, that the heating systems in these units had similar expansion joints which have been removed. During the 25 to 30 years that the original units were in service, erosion of these joints was likely, and could have caused asbestos fibers to accumulate in the dust.

Another possibility is that residual debris from the removal of vinyl-asbestos floor tiles, such as was found in other sites, may have been left in the ducts during floor tile removal and replacement. Conversations with the TEM analysis indicate that there was some evidence of chlorine observed during the identification of the asbestos fibers by X-ray dispersion analysis in samples from some sites. The most likely source of this element, considering the site history, is the vinyl chloride polymer which forms the floor tile matrix. However, other asbestos sources, such as debris imported into the facilities from outside activities of the occupants, cannot be ruled out.

The vinyl floor tiles in the three housing units inspected were in good condition, but, should they become broken or damaged, asbestos fibers may be released. The recent EPA clarification of the definition for damaged non-friable materials apparently removes some concerns about the status of these materials at the time of renovation or demolition. Inspection of these normally non-friable materials prior to demolition is required, but, if they are in good condition at the time, they may be left in place as long as planned demolition procedures will not release a significant amount of asbestos fibers. However, if demolition will subject these non-friable materials to grinding, sanding, or abrading, or if demolition involves burning of the structure or debris from the structure, all forms of ACM, including these floor tiles, must be removed in advance.

The vinyl floor tiles should be left in place and managed under an O&M. The floor tiles should then be removed in accordance with regulations applicable at the time.

SECTION 3. AIRBORNE ASBESTOS ASSESSMENT

Other suspect materials noted were roof shingles and felt, which should be managed under an O&M program. Care should be taken during renovations or demolition to identify suspect materials that may have been hidden from the view of the assessment team. The suspect materials observed by the field team, and any hidden suspect materials found later, should be analyzed for the presence of asbestos prior to being disturbed.

SECTION 3. AIRBORNE ASBESTOS ASSESSMENT

Sampling for airborne asbestos fibers was performed at one unit of the Swansea, Massachusetts FHU on 20 April 1990 by WESTON. Dr. Leonard Nelms, a Certified Industrial Hygienist (CIH) visited the site and collected the samples using procedures described in the Asbestos Hazard Emergency Response Act (AHERA). These procedures were designed for verifying that clean-up of a contained area, following completion of an asbestos abatement action in public schools, was adequately performed. All samples were analyzed by TEM following the protocols specified in AHERA.

3.1 SAMPLING RATIONALE

WESTON followed the procedures and guidelines set forth during discussions among ANL, USATHAMA, and WESTON staff members, to provide a fast-track field sampling program and rapid analysis of samples collected. The urgency of this effort was driven by the finding that asbestos fibers were a component of the dust contained in the sub-slab ductwork of a number of the installations. The approach chosen required that the WESTON CIH collect four samples of air from selected heating registers, generally from one in each of the living room, kitchen, bedroom, and bathroom. Air samples were to be collected in one unoccupied unit at the site while the heating system was operating, to simulate the worst possible case for exposure of occupants. The vacant unit selected was to be one of those from which dust within ducts had been sampled during the initial investigations, where possible. If no unit that had been sampled previously was vacant at the time, another unit was to be chosen from among those available, and samples of dust from the ducts were to be collected. These samples were to be collected after completion of sampling for airborne fibers, using the procedures employed previously. Unit 15 was selected at the Swansea site, since it was vacant and had previously been sampled.

3.2 FIELD ACTIVITIES AND OBSERVATIONS

The sampling activities at this site were performed during the afternoon, on a warm spring day. The diaphragm pumps were unpacked, placed in the selected sampling locations, and turned on as soon as possible after arrival at the site to allow the mechanical components to warm up prior to checking flow rates. The heating system was turned on as soon as the pumps were in operation, to allow the air flow to stabilize, since it had not been in operation recently.

A test filter cassette, identical to those used for sample collection, was placed on the pump system being calibrated and the airflow into the filter was measured using a calibrated rotameter. This followed AHERA requirements and good industrial hygiene (IH) sampling protocols. After the pumps were calibrated, a sampling cassette made of an electrically conducting plastic was attached to the sample line, placed directly over the heating register to be sampled, and securely held in place with duct tape. The cassette contained a 25 mm diameter mixed cellulose ester (MCE) membrane filter, having a nominal pore size of 0.45 μ m. The time at which sample collection was begun was recorded and the air was sampled for approximately three hours.

The pumps were operated for a length of time sufficient to draw about 1,600 liters (L) of air through each filter, based on the initial daily calibration. At the expiration of this time, the filter cassettes were removed from the heating register, inverted while the airflow continued, and lightly tapped to dislodge any

fibers that may have adhered to the cowl of the cassette. Then, the cassettes were carefully removed from the sampling pump, resealed with the plugs and end caps that are a part of the cassettes, and labeled. The flow rate of each pump was again determined by exactly the same procedure used prior to the start of sample collection. After all sampling was completed, the heating system was returned to the same condition and setting that was found on entry to the unit.

The volume of air drawn through each filter was calculated, based on the average sample flow rate and the duration of sample collection, and recorded on the cassette label. Each cassette was then sealed in a anti-static plastic zipper-seal bag and placed in a shipping carton with a custom-designed anti-static foam liner. All sampling equipment, samples and other gear were then removed from the unit and the site was secured prior to departure.

Samples were collected from the four interior locations selected. In addition, a field blank was prepared and a background sample of ambient outside air was taken near the entry door to the kitchen. No significant problems were encountered during the sample collection activities. After completion of air sampling, a dust sample was taken from the kitchen vent using the procedures described in the ANL SAP.

During the sampling effort the facility was examined to identify any potential sources of asbestos that may be responsible for the asbestos fibers found in the dust. The heating system has a expansion joint that appeared to have been in place for some time. This type of material sometimes contains asbestos. The heating ducts themselves appear to be a cementitious material that may contain asbestos.

3.3 LABORATORY PROCEDURES AND RESULTS

Samples were shipped to the laboratory soon after collection by common carrier. The dust sample was examined using TEM, as described in Section 2. The four samples of air from within the unit were analyzed by WESTON's NVLAP-accredited TEM facility, using the sample preparation and analytical procedures set forth in the EPA AHERA method. A section of the exposed filter was cut from each sample and three wedges were placed on copper wire grids for TEM mounting. The samples were etched in a plasma asher, which also destroyed some of the organic materials that may have been collected, and vacuum-coated with a thin layer of carbon, embedding the fibers that were on the filter surface. Each carbon-coated grid was placed in a Jaffe wick washer, in which the MCE filter matrix was dissolved and wicked away, leaving behind the carbon film containing any asbestos fibers collected. The grids were then examined and found to be ready for analysis.

Once the sample grids were prepared, each grid was examined by the TEM protocols of AHERA. A specified number of grid openings were scanned looking for fibers that may be asbestos. Typically, between six and ten grid openings had to be examined to comply with the detection limits set forth in the regulations. Whenever a fiber was observed during this examination, the microscopist examined its morphology and determined its elemental composition from the emitted X-ray spectrum. If these indicated that it may be an asbestiform mineral, the crystal lattice structure was examined by observation of its electron diffraction pattern. The fiber was then classified as non-asbestos or by the type of asbestos determined to be present during the analysis, as appropriate.

The results for the four samples from inside Unit 15 are presented in Table 3.1. No asbestos fibers were detected in any of these samples at a limit of detection that was between 0.004 and 0.005 fibers per cubic centimeter (f/cc). Based on these findings, the background sample and field blank were not examined, since no fibers were detected inside the unit. Asbestos was found in the three dust samples previously collected in this unit, as well as in the sample collected from the kitchen area vent. This means that asbestos was found in all of the ten samples of dust collected in units at this location.

TABLE 3.1. RESULTS OF AIRBORNE ASBESTOS SAMPLING AND ANALYSIS
(ALL VALUES IN FIBERS/CC)

SAMPLE NUMBER	SAMPLE LOCATION	ASBESTOS IN DUST	ASBESTOS CONCENTRATION	ASBESTOS TYPE FOUND
SW-15-LR	Living Room	YES	ND <0.005	ND
SW-15-KI	Kitchen	YES	ND <0.005	ND
SW-15-BR	Bedroom	YES	ND <0.005	ND
SW-15-BA	Bath Room	YES	ND <0.005	ND

ND = Not Detected at the Limit of Detection Cited.

Note: The asbestos in all dust samples was chrysotile.

3.4 CONCLUSIONS AND RECOMMENDATIONS

The air samples collected indicate that asbestos fibers from the dust found within the heating system ductwork are not being released in significant quantities at this facility. The airborne asbestos concentration was lower than the detection limit and below the AHERA threshold. The limits of detection were <0.005 f/cc, which is at or below the acceptability limit set forth in AHERA for clearance of an abatement area in a school, and were far lower than the OSHA Permissible Exposure Limit (PEL) for workers of 0.2 f/cc.

While asbestos has been shown to pose a health risk to humans at high fiber concentrations, there are no definitive studies that indicate that a risk is associated with low-level exposures such as the 0.005 f/cc AHERA limit. Therefore, sampling and analysis for airborne asbestos at this site did not reveal any health risk to the occupants of the houses, based on the TEM analyses of the samples collected. However, it is recommended by the U.S. Army Environmental Hygiene Agency (AEHA) that, if the units are to remain under the management, operational control, or ownership of the Army, additional sampling and analysis for airborne asbestos be undertaken. These studies should be performed to provide data from at least ten percent or a minimum of three of the housing units, whichever is greater. This additional sampling and analysis effort, along with the other recommended actions, will help to ensure that there is no long-term exposure risk to the occupants or to maintenance personnel.

SECTION 4. SUMMARY OF FINDINGS

SECTION 4. SUMMARY OF FINDINGS

Sampling and analyses performed at the Swansea, Massachusetts FHU reveal the presence of issues of concern from an environmental standpoint. The most significant are the detection of asbestos in all of the ten dust samples, in one of the four pipe insulation samples, and in ten of 11 samples of floor tile.

The following practices should be observed with regard to the known and suspected asbestos-containing materials identified:

- The friable asbestos-containing pipe insulation, although present in a small amount, presents the greatest concern at this site. While the general condition of this ACM is good, it can be damaged if mishandled. This material should be repaired as needed, encapsulated, and managed under an O&M Plan as long as it remains in place. A prudent course of action would be removal of this material and replacement with an asbestos substitute. This action should be done in accordance with state and Federal regulations.
- The vinyl floor coverings pose no significant risk as long as they are in good condition and are not damaged by excessive wear or misuse. They should be left in place and managed under an O&M program which describes procedures for the regular inspection of the floor coverings and the removal and replacement of any that become damaged.
- Other suspect materials identified at the site, including roofing shingles and felt, should be assumed to contain asbestos and managed in place under an O&M program until they are either removed or determined to contain no asbestos.
- Additional sampling and analysis for airborne asbestos at this site is recommended by AEHA, if the units are to remain under the management, operational control, or ownership of the Army. These studies should be performed to provide data from at least ten percent or a minimum of three of the housing units, whichever is greater.

The air monitoring performed in Unit 15 indicated that no detectable asbestos was being emitted in air from dust collected in the heating ducts. The detection limit of the method, <0.005 f/cc, is below the AHERA limit and well below the OSHA PEL of 0.2 f/cc.

APPENDIX A.1. FIELD DATA, ASBESTOS SAMPLING

SITE SURVEY LOG

CLIENT Argonne National Labs WESTON WORK ORDER NO. 2104-13-01
 FACILITY/BLDG. NO. SWANSEA, MA 14 MISSILE LOOP
 FACILITY CONTACT JAN CRAFTON TELEPHONE NUMBER (508) 796-3551
 TECHNICIAN NAME ROBERT LYNCH SIGNATURE Robert Lynch
 TECHNICIAN NAME _____ SIGNATURE _____
 TIME ARRIVED 1000 TIME DEPARTED 1015 DATE 08 FEB 90
 dd mm yy

SPECIFIC SITE ACTIVITIES, COMMENTS, INTERVIEW RESULTS & BRIEF DESCRIPTION OF FACILITY

This is a one story 3 bedroom home with tan aluminum. There are 3 types of floor tile present. There is no pipe insulation. Only the floor vent in the kitchen has been sealed. The roofing shingles and felt are suspect.

This is a capehart style home. It was chosen because it is vacant and based upon maintenance records, available drawings, and discussions with housing ~~management~~ management personnel.

The actual address is 14 Missile Loop, Swansea, MA.

ACTIVITY CHECKLIST

Interviews Completed ✓
 Drawings Reviewed ✓
 Drawings Attached ✓
 Visual Inspection ✓
 Number of Photos 0

Number of Samples 6
 Survey Form Completed ✓
 Site Log Completed ✓
 Chain-of-Custody Initiated ✓
 Exp. Assess. Form Init. ✓

Q.A. Check _____ SIGNATURE _____

DATE 1 / 1 / 90
 dd mm yy

ASBESTOS SURVEY DATA

0119

BLDG. NO.: 0114
INSTALLATION 011E

TASK TEAM MEMBERS
ROBERT LYNCH
STAN ANDERSON

W.O. No. 2104-13-01
CLIENT: ARGONNE NATIONAL LAB

BLDG. NAME: SWANSEA FAMILY HSG
BLDG. DESCRIPTION: CAPE HART STYLE

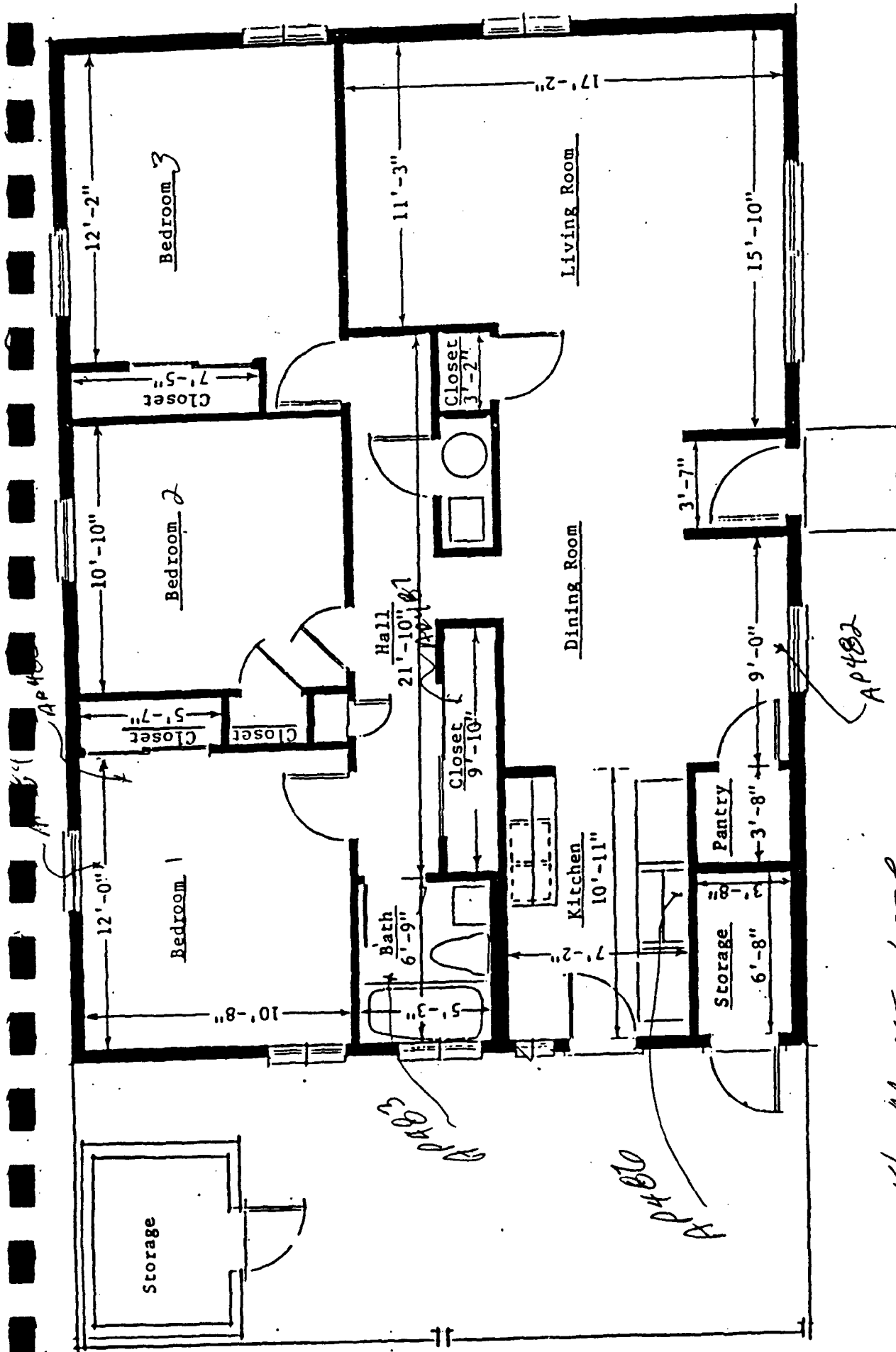
DATE (dd/mm/yy): 08/02/90
TIME ARRIVED: 1000

ITEM NO.	LAB SAMPLE NO.	BASE NO.	STATE	UNIT NO.	SAMPLE CODE	AREA	QUANTITY	PHOTO	E.A. FORM NO.	NOTES
1.	AP482-1E-MA-0114-A11D					DINING ROOM	W/A		0987A	01
2.	AP483-1E-MA-0114-A11D					BATH	W/A		0987A	01
3.	AP484-1E-MA-0114-A11D					BEDROOM 1	W/A		0987A	01
4.	AP485-1E-MA-0114-A11T					PATCH	110		0987B	012
5.	AP486-1E-MA-0114-A11T					KITCHEN	130		0987C	013
6.	AP487-1E-MA-0114-A11T					ALL RMS EXCEPT KITCH	1306		0987D	014
7.	-----									
8.	-----									
9.	-----									
10.	-----									
11.	-----									
12.	-----									

NOTE NO.	NOTES/REMARKS/COMMENTS/DETAILS/OTHER MATERIALS, QUANTITY, ETC.
01	dust sample from old air ducts in floor.
02	9x9 grey floor tile, patch in bedroom 01
03	12x12 floor tile with floral pattern in kitchen only.
04	9x9 white floor tile in all rooms except kitchen.

TECHNICIAN SIGNATURE Robert Lynch

QUALITY ASSURANCE SIGNATURE _____



FLOOR PLAN - CAPEHART TYPE

14 MISSE LOOP

SWANSEA MA

SITE SURVEY LOG

CLIENT Argonne National Labs WESTON WORK ORDER NO. 2104-13-01
 FACILITY/BLDG. NO. SWANSEA, MA 15 MISSILE LOOP
 FACILITY CONTACT JOHN GRAFION TELEPHONE NUMBER (SOE) 796-3551
 TECHNICIAN NAME ROBERT LYNCH SIGNATURE Robert Lynch
 TECHNICIAN NAME _____ SIGNATURE _____
 TIME ARRIVED 1015 TIME DEPARTED 1045 DATE 22 FEB 90
 dd mm yy

SPECIFIC SITE ACTIVITIES, COMMENTS, INTERVIEW RESULTS & BRIEF DESCRIPTION OF FACILITY

This is a one story 3-bedroom home, with blue aluminum siding. The roof has suspect shingles and felt roofing. Only the kitchen floor vent has been sealed. There are four types of floor tile. There is a small amount of floor tile pipe insulation present. There is also one expansion joint in the heating room. This house is a Capehart style home. It was chosen because it was vacant and also because of available drawings, maintenance records, and discussions with housing management personnel. The actual address is 15 Missile Loop, Swansea, Ma.

ACTIVITY CHECKLIST

Interviews Completed <u>✓</u>	Number of Samples <u>9</u>
Drawings Reviewed <u>✓</u>	Survey Form Completed <u>✓</u>
Drawings Attached <u>✓</u>	Site Log Completed <u>✓</u>
Visual Inspection <u>✓</u>	Chain-of-Custody Initiated <u>✓</u>
Number of Photos <u>1</u>	Exp. Assess. Form Init. <u>✓</u>
Q.A. Check _____	SIGNATURE _____
	DATE <u>1</u> / <u>90</u> dd mm yy

ASBESTOS SURVEY DATA

0123

BLDG. NO.: 0115
INSTALLATION 0118

TASK TEAM MEMBERS
ROBERT LYNCH
STAN ANDERSON

W.O. No. 2104-13-01
CLIENT: ARGONNE NATIONAL LAB

BLDG. NAME: SUNDLER FAMILY HSCG
BLDG. DESCRIPTION: CAPE HART STYLE

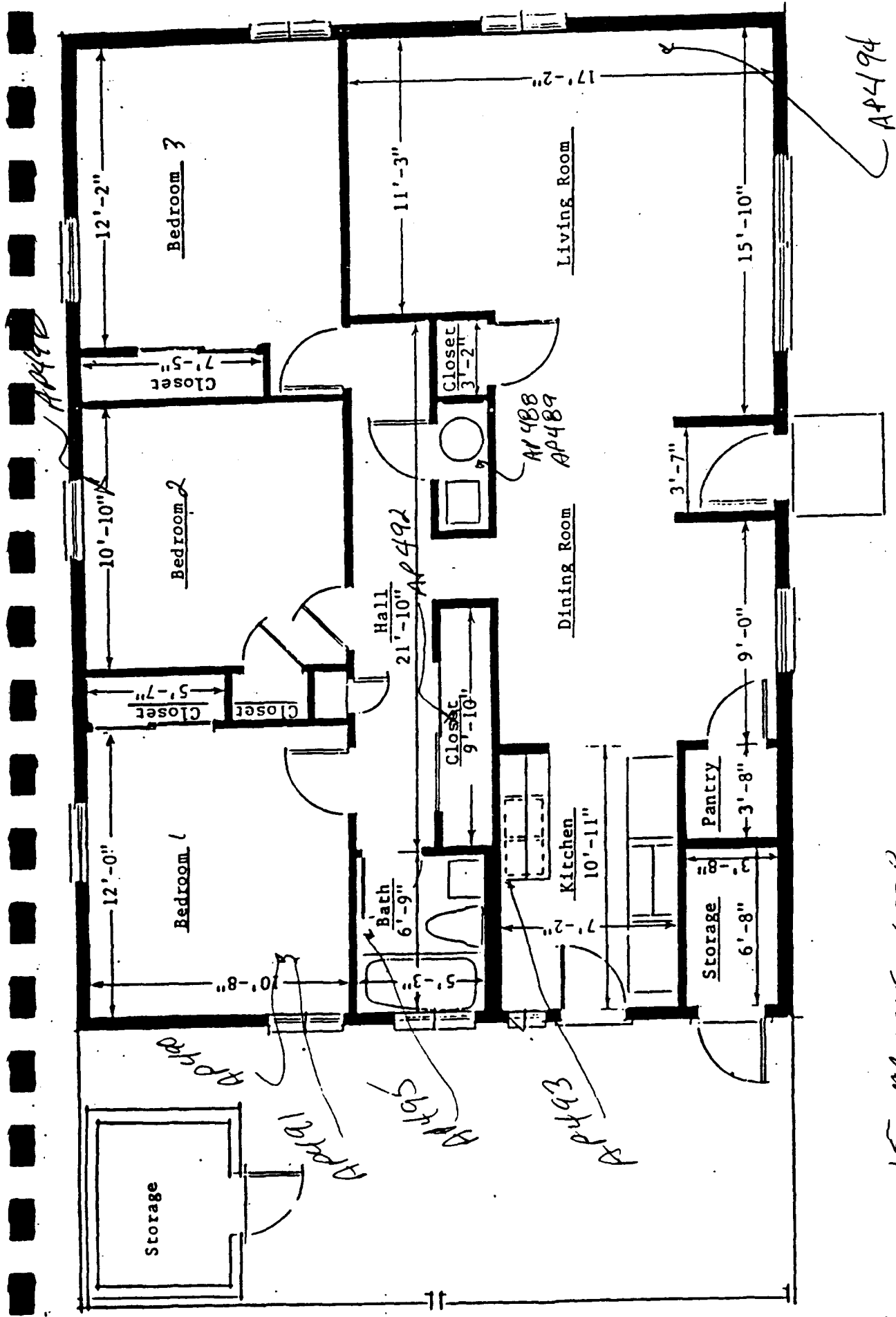
DATE (dd/mm/yy): 05/02/90
TIME ARRIVED: 1015

ITEM NO.	LAB SAMPLE NO.	BASE NO.	STATE	UNIT NO.	SAMPLE CODE	AREA	QUANTITY	PHOTO	E.A. FORM NO.	NOTES
1.	AP488-18-MA-015-AIE					HEAVY WGT RIM	1		0988A	01
2.	AP489-18-MA-015-AIE					HEAVY WGT RIM	N/A		0988A	01
3.	AP490-18-MA-015-AIE					PATCH	15		0988B	02
4.	AP491-18-MA-015-AIE					PATCH	15		0988C	03
5.	AP492-18-MA-015-AIE					ALL 4 IRMS LKCKRT KIT	1306		0988D	04
6.	AP493-18-MA-015-AIE					KITCHEN	130		0988E	05
7.	AP494-18-MA-015-AIE					LIVING ROOM	N/A		0988F	06
8.	AP495-18-MA-015-AIE					BATH	N/A		0988F	06
9.	AP496-18-MA-015-AIE					BEDROOM 2	N/A		0988F	06
10.	-----					-----	---		---	---
11.	-----					-----	---		---	---
12.	-----					-----	---		---	---

NOTE NO.	NOTES/REMARKS/COMMENTS/DETAILS/OTHER MATERIALS, QUANTITY, ETC.
01	air cell type insulation, less than 1 linear foot.
02	9x9 light brown patch of floor tile in bedroom 1
03	9x9 white with black floor tile, used to patch area in bedroom 1
04	9x9 white with brown floor tile in all rooms except kitchen
05	12x12 floral pattern floor tile in kitchen only
06	dust samples from old floor ducts

TECHNICIAN SIGNATURE Robert Lynch

QUALITY ASSURANCE SIGNATURE _____



FLOOR PLAN - CAPEHART TYPE

15 MUSSE COOP

SWANSEA, MA

SITE SURVEY LOG

CLIENT Argonne National Labs WESTON WORK ORDER NO. 2104-13-01
 FACILITY/BLDG. NO. SWANSEA MA. 13 MISSILE LOOP
 FACILITY CONTACT JOHN GRAFTON TELEPHONE NUMBER (508) 796-3551
 TECHNICIAN NAME ROBERT LYNCH SIGNATURE Robert Lynch
 TECHNICIAN NAME _____ SIGNATURE _____
 TIME ARRIVED 1045 TIME DEPARTED 1100 DATE 08 Feb 90
 dd mm yy

SPECIFIC SITE ACTIVITIES, COMMENTS, INTERVIEW RESULTS & BRIEF DESCRIPTION OF FACILITY

This is a one story, three bedroom home with white aluminum siding. The roofing shingles and felt are suspect. There are four types of floor tile present. There is a small amount of pipe insulation in the heating room. Only the floor air vent in the kitchen was sealed. The actual address is 13 missile loop, Swansea Ma. It was chosen because it is vacant and based upon available drawings, maintenance records and discussions with housing management personnel.

ACTIVITY CHECKLIST

Interviews Completed <u>✓</u>	Number of Samples <u>9</u>
Drawings Reviewed <u>✓</u>	Survey Form Completed <u>✓</u>
Drawings Attached <u>✓</u>	Site Log Completed <u>✓</u>
Visual Inspection <u>✓</u>	Chain-of-Custody Initiated <u>✓</u>
Number of Photos <u>1</u>	Exp. Assess. Form Init. <u>✓</u>
Q.A. Check _____	SIGNATURE _____
	DATE <u>1</u> / <u>90</u> dd mm yy

ASBESTOS SURVEY DATA

0127

BLDG. NO.: 10113
INSTALLATION 17118

TASK TEAM MEMBERS
ROBERT LYNCH
STAN ANDERSON

W.O. No. 2104-13-01
CLIENT: ARGONNE NATIONAL LAB

BLDG. NAME: SWANSEA FAMILY HSG
BLDG. DESCRIPTION: CAREHART STYLE

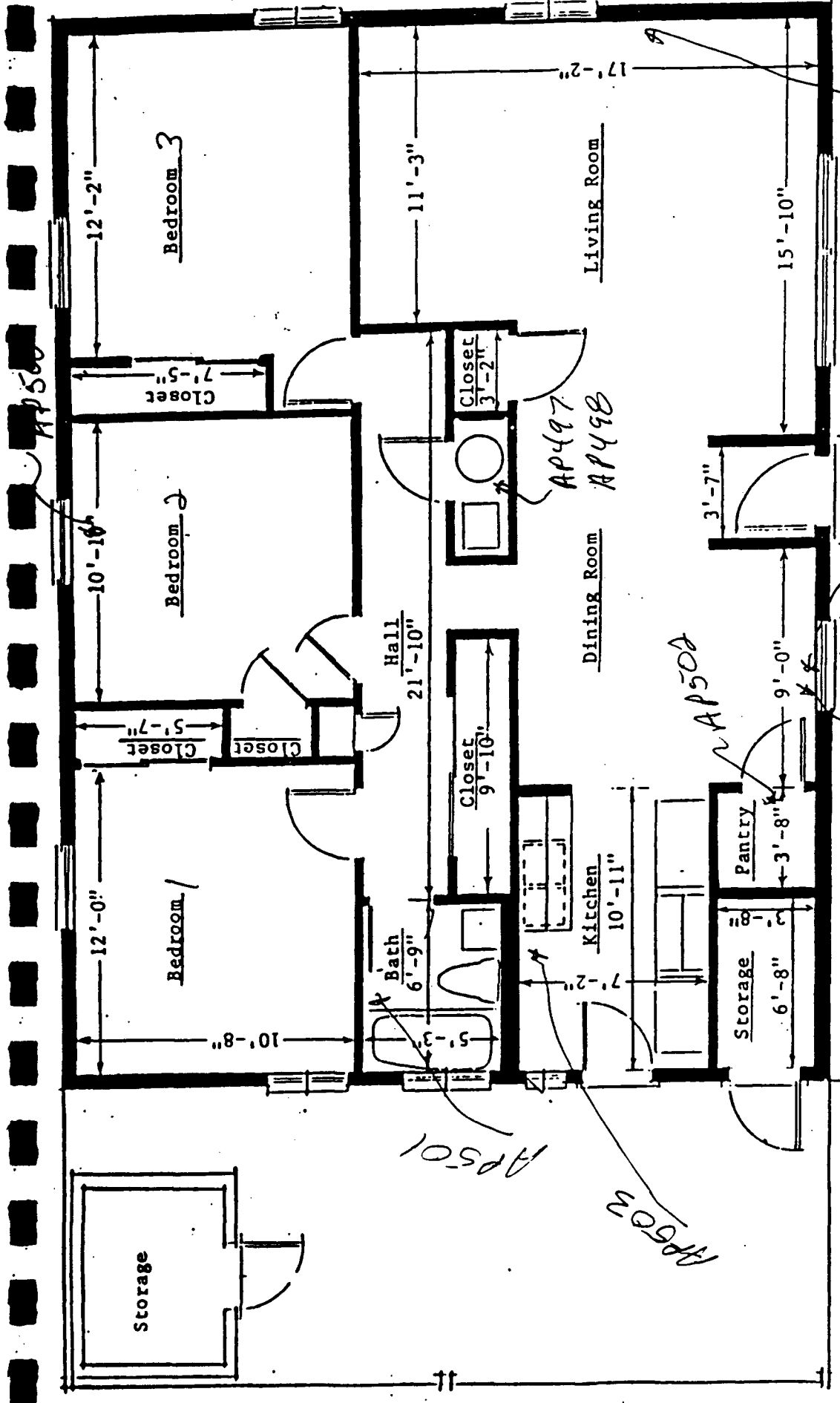
DATE (dd/mm/yy): 08/02/90
TIME ARRIVED: 1045

ITEM NO.	LAB SAMPLE NO.	BASE NO.	STATE	UNIT NO.	SAMPLE CODE	AREA	QUANTITY	PHOTO	E.A. FORM NO.	NOTES
1.	AP497-18-MA-013-AIR					HEATING RM	1		0989A	01
2.	AP498-18-MA-013-AIR					HEATING RM	N/A		0989A	01
3.	AP499-18-MA-013-AIR					LIVING RM	N/A		0989B	02
4.	AP500-18-MA-013-AIR					BEDROOM	N/A		0989B	02
5.	AP501-18-MA-013-AIR					BATH	N/A		0989B	02
6.	AP502-18-MA-013-AIR					ALL ROOMS EXCEPT KITCH.	1306		0989C	03
7.	AP503-18-MA-013-AIR					KITCHEN	130		0989D	04
8.	AP504-18-MA-013-AIR					PATCH	15		0989E	05
9.	AP505-18-MA-013-AIR					PATCH	15		0989F	06
10.	1111-1-1-1-1-1-1						111		1111	1
11.	1111-1-1-1-1-1-1						111		1111	1
12.	1111-1-1-1-1-1-1						111		1111	1

NOTE NO.	NOTES/REMARKS/COMMENTS/DETAILS/OTHER MATERIALS, QUANTITY, ETC.
01	air cell type pipe insulation, less than 4" size. (less than 1 linear foot)
02	dust sample from old floor air ducts
03	9x9 white with brown floor tile, in all rooms except kitchen.
04	12x12 floor tile with floral pattern, in kitchen only.
05	9x9 green floor tile, used to patch areas.
06	9x9 white floor tile, used to patch areas.

TECHNICIAN SIGNATURE Robert Lynch

QUALITY ASSURANCE SIGNATURE _____



13 MISSILE LOOP

FLOOR PLAN - CAPEHART TYPE

SWINSEH, MA.

APPENDIX A.2. LABORATORY DATA, ASBESTOS SAMPLES

BULK SAMPLE ANALYSIS SUMMARY

Weston W.O. No. 2104-13-01-0000

Sample Number AP485 through Sample AP505

AO LAB ID NO	CLIENT/CLIENT ID	LOCATION	MATERIAL DESCRIPTION*	DATE RECEIVED	RESULTS**					LAYERS	ANALYST
					CH	AM	CR	OT	TL		
AP485	18-MA-014-AFT	PATCH	NF, GY, 9X9 FT	02/12/90	8	ND	ND	ND	8	Yes	07323
AP486	18-MA-014-AFT	KITCHN	NF, 12X12 FT	02/12/90	ND	ND	ND	ND	ND	No	07323
AP487	18-MA-014-AFT	ALLRMS	NF, WH, 9X9 FT	02/12/90	1	ND	ND	ND	1	Yes	07323
AP488	18-MA-015-API	HEATRM	F, INSULATION	02/12/90	ND	ND	ND	ND	ND	Yes	07323
AP489	18-MA-015-API	HEATRM	F, INSULATION	02/12/90	20	ND	ND	ND	20	Yes	07323
AP490	18-MA-015-AFT	PATCH	NF, BR, 9X9 FT	02/12/90	8	ND	ND	ND	8	Yes	07323
AP491	18-MA-015-AFT	PATCH	NF, WH, 9X9 FT	02/12/90	10	ND	ND	ND	10	No	06072
AP492	18-MA-015-AFT	ALLRMS	NF, WH, 9X9 FT	02/12/90	5	ND	ND	ND	5	Yes	06072
AP493	18-MA-015-AFT	KITCHN	NF, 12X12 FT	02/12/90	ND	ND	ND	ND	ND	No	06072
AP497	18-MA-013-API	HEATRM	F, PIPE INSUL	02/12/90	ND	ND	ND	ND	ND	Yes	06072
AP498	18-MA-013-API	HEATRM	F, PIPE INSUL	02/12/90	ND	ND	ND	ND	ND	Yes	06072
AP502	18-MA-013-AFT	ALLRMS	NF, WH, 9X9 FT	02/12/90	3	ND	ND	ND	3	No	06072
AP503	18-MA-013-AFT	KITCHN	NF, 12X12 FT	02/12/90	ND	ND	ND	ND	ND	No	06072
AP504	18-MA-013-AFT	PATCH	NF, GR, 9X9 FT	02/12/90	5	ND	ND	ND	5	Yes	07323
AP505	18-MA-013-AFT	PATCH	NF, WH, 9X9 FT	02/12/90	3	ND	ND	ND	3	Yes	07323

MATERIAL DESCRIPTION	FRIABLE ¹	COLOR ²		SYSTEM ³
Friable ¹ , Color ² , System ³ , Type	F - Friable NF - Non-Friable	BK - Black BL - Blue BR - Brown GR - Green GY - Gray	RD - Red TN - Tan WH - White YL - Yellow	CHW - Chilled Water DOM - Domestic Water HHW - Heating Hot Water STM - Steam UNK - Unknown
** RESULTS				
CH - Chrysotile AM - Amosite CR - Crocidolite	OT - Other TL - Total			

Upon issue, this report may be reproduced only in full.

All analyses are performed in accordance with the methods set forth in U.S. EPA 600/M4-82-020, as amended. Weston's Optical Microscopy Laboratory is accredited by the National Institute of Standards and Technology's National Voluntary Laboratory Accreditation Program for asbestos fiber analysis (Laboratory Code 1254).



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Transmission Electron Microscopy Asbestos Summary Report

Client: Argonne National Laboratories Weston W.O. No.: 2104-13-01-0000

Sample Type(s): Dust and Floor Tiles Sampling Location: Swansea

QUALITATIVE ANALYSIS

FLOOR TILES: A 0.5 to 2.0 gram portion of each floor tile sample was ultrasonically disaggregated in four milliliters of deionized, 0.2 μ m membrane filtered water. After the coarse fraction settled, a drop of the suspended, clay-sized fraction was placed on a Formvar coated 200 mesh Cu TEM grid and allowed to dry. The grid was carbon coated for thermal stability in the electron beam and examined with a Philips CM12 transmission electron microscope operating at 120 kilovolts accelerating voltage.

DUST WIPE SAMPLES: A generous loading of dust was collected on a pre-wetted, 25 square centimeter section of a cleanroom wipe. The wipe was placed in a two ounce wide mouth collection vial and returned to the laboratory. Ten to fifteen milliliters of filtered, deionized water was added to suspend the dust. The suspension was ultrasonically dispersed and the coarse fraction was allowed to settle. A drop of the suspension was placed on a Formvar coated 200 mesh Cu TEM grid and allowed to dry. The grid was carbon coated as above and examined by transmission electron microscopy at 120 kilovolts accelerating voltage.

ANALYTICAL RESULTS

<u>SAMPLE IDENTIFICATION</u>	<u>RESULTS</u>
AP482-18-MA-014-ATD	Positive
AP483-18-MA-014-ATD	Positive
AP484-18-MA-014-ATD	Positive
AP486-18-MA-014-AFT	Positive
AP493-18-MA-015-AFT	Negative
AP494-18-MA-015-ATD	Positive



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ANALYTICAL RESULTS
(continued)

SAMPLE IDENTIFICATION

RESULTS

AP495-18-MA-015-ATD

Positive

AP496-18-MA-015-ATD

Positive

AP499-18-MA-013-ATD

Positive

AP500-18-MA-013-ATD

Positive

AP501-18-MA-013-ATD

Positive

AP503-18-MA-013-ATD

Positive

Greg Hall
(Approved for Transmittal)

3/13/90
(Date)

* This test report relates only to the specific items tested.

** These sample results may only be reproduced in full, and are valid only if approved for transmittal.

APPENDIX B.1. FIELD DATA, AIRBORNE ASBESTOS SAMPLING

AIR MONITORING DATA

CLIENT Argonne Nat'l Lab. ATC PROJECT NUMBER 2104-13-02
 PROJECT LOCATION Savannah, MA Unit 15
 WORK AREA ID NO _____ SAMPLE NO. Sw-15-LR

SAMPLE TYPE

PERSONNEL

NAME

DATE

☒ AMBIENT

☐ WORK AREA

☐ ADJACENT ROOM

☐ BACKGROUND

☐ OTHER

☐ CLEAN ROOM

☐ AFD EXHAUST

☐ CLEARANCE

☐ INITIAL

☐ FINAL REOCCUPANCY

☐ OTHER

☐ TWA SAMPLE

(SEE ADDITIONAL SHEETS)

SAMPLE DATA

Time Start 88 Time End 1140 Sample Time 1523 min

10

10.3

10.2

11

10.2

2290

L. Nelms

20 Apr. '90

ANALYTICAL DATA

DATE

DL 10 fibers 100 fields

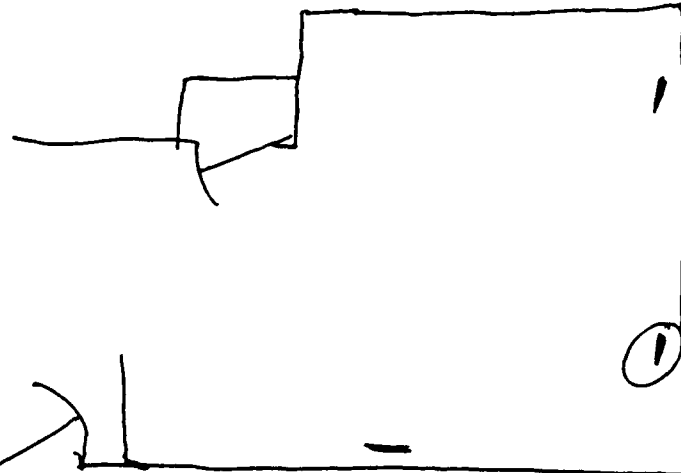
Sample obtained when the sample was
 analyzed by TSCM

Date

	1	2	3	4	5	6	7	8	9	10
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

NOTES SKETCHES REMARKS

TEM



① Sw-15-LR

AIR MONITORING DATA

CLIENT Argonne Nat'l Lab ATC PROJECT NUMBER 2104-13-02
 PROJECT LOCATION Swansea MA Unit 15
 WORK AREA ID NO. _____ SAMPLE NO. SW-15-KI

SAMPLE TYPE

PERSONNEL

NAME

TIME

☒ AMBIENT

WORK AREA

ADJACENT ROOM

BEHIND DOOR

☒ Kitchen Vent

CLEAN ROOM

AIR EXHAUST

☐ CLEARANCE

☐ INITIAL

☐ FINAL REOCCUPANCY

☐ OTHER

☐ TWA SAMPLE

(SEE ADDITIONAL SHEETS)

SAMPLE DATA

START TIME

DEF

☒ 36"

NUMBER

37

START TIME

10

10.8

10.6

START TIME

11

10.4

2340

1141

1522

221

L. Nelms

20 Apr. '90

ANALYTICAL DATA

ANALYST

DATE

TIME

LOCATION

DESCRIPTION

ANALYST

DATE

TIME

LOCATION

DESCRIPTION

ANALYST

DATE

TIME

LOCATION

DESCRIPTION

ANALYST

DATE

TIME

LOCATION

DESCRIPTION

ANALYST

DATE

TIME

LOCATION

DESCRIPTION

ANALYST

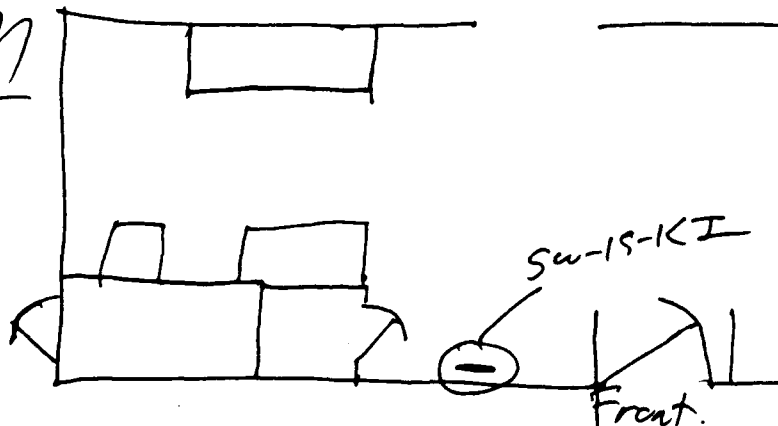
DATE

TIME

NOTES SKETCHES REMARKS

Sampled Vent in Dining Area of Kitchen. Also collected dust sample there.

TEM



AIR MONITORING DATA

CLIENT Argonne Nat'l Lab ATC PROJECT NUMBER 2104-13-02
 PROJECT LOCATION Swansea MA Unit 1S
 WORK AREA ID NO. _____ SAMPLE NO. Sw-15-BR

SAMPLE TYPE

PERMANENT

NAME

☒ AMBIENT

☐ WORK AREA

☐ ADJACENT ROOM

☐ BACKGROUND

☐ OTHER

☐ CLEAN ROOM

☐ AFD EXHAUST

☐ CLEARANCE

☐ INITIAL

☐ FINAL REOCCUPANCY

☐ OTHER

☐ TWA SAMPLE

(SEE ADDITIONAL SHEETS)

Bedroom Vent

SAMPLE DATA

87

10

11

10.0

9.9

10.0

2250

1139

1525

226

L. Nelms

20 Apr 90

ANALYSIS DATA

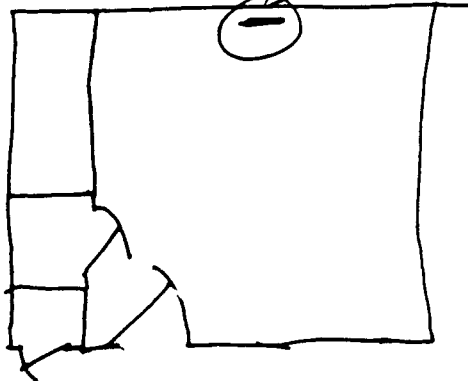
1 2 3 4 5 6 7 8 9 10

REMARKS

Center BR.

Sw-15-BR

TEM



AIR MONITORING DATA

CLIENT Argonne Nat'l Lab. ATC PROJECT NUMBER 2104-13-02
 PROJECT LOCATION Swansea MA- Unit 15
 WORK AREA ID NO. _____ SAMPLE NO. SW-15-BA

SAMPLE TYPE	
<input type="checkbox"/> PERSONNEL <input type="checkbox"/> WARE <input type="checkbox"/> OTHER	<input checked="" type="checkbox"/> AMBIENT <input type="checkbox"/> WORK AREA <input type="checkbox"/> ADJACENT ROOM <input type="checkbox"/> BACK ROOM <input type="checkbox"/> OTHER <u>Bathroom Vent</u>
<input type="checkbox"/> CLEAN ROOM <input type="checkbox"/> AFD EXHAUST <input type="checkbox"/> CLEARANCE <input type="checkbox"/> INITIAL <input type="checkbox"/> FINAL REOCCUPANCY <input type="checkbox"/> OTHER <input type="checkbox"/> TWA SAMPLE (SEE ADDITIONAL SHEETS)	

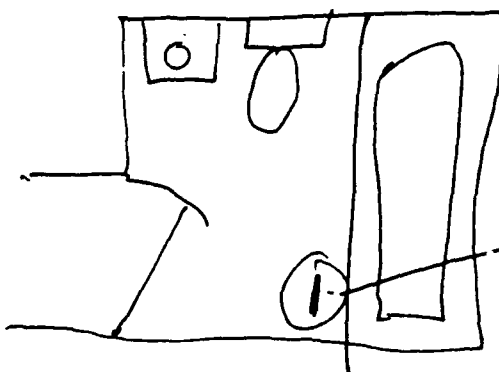
SAMPLE DATA	
92 10 10.9 10.8 11 10.7 2380	1142 1522 220 L. Nelms 20 Apr. '90

~~ANALYSIS~~

1	2	3	4	5	6	7	8	9	10

NOTES SKETCHES REMARKS

TEM



SW-15-BA

AIR MONITORING DATA

CLIENT Argonne Nat'l Lab ATC PROJECT NUMBER 2104-13-02
 PROJECT LOCATION Swansea, MA. Unit 15
 WORK AREA ID NO. _____ SAMPLE NO. SW-15-04T

SAMPLE TYPE

PERSONNEL

NAME

DATE

☒ AMBIENT

☐ WORK AREA

☐ ADJACENT ROOM

☒ BACKGROUND

☐ OTHER

☐ CLEAN ROOM

☐ AFD EXHAUST

☐ CLEARANCE

☐ INITIAL

☐ FINAL REOCCUPANCY

☐ OTHER

☐ TWA SAMPLE

(SEE ADDITIONAL SHEETS)

SAMPLE DATA

93

10

11

10.4

7.4

8.9

1970

1143

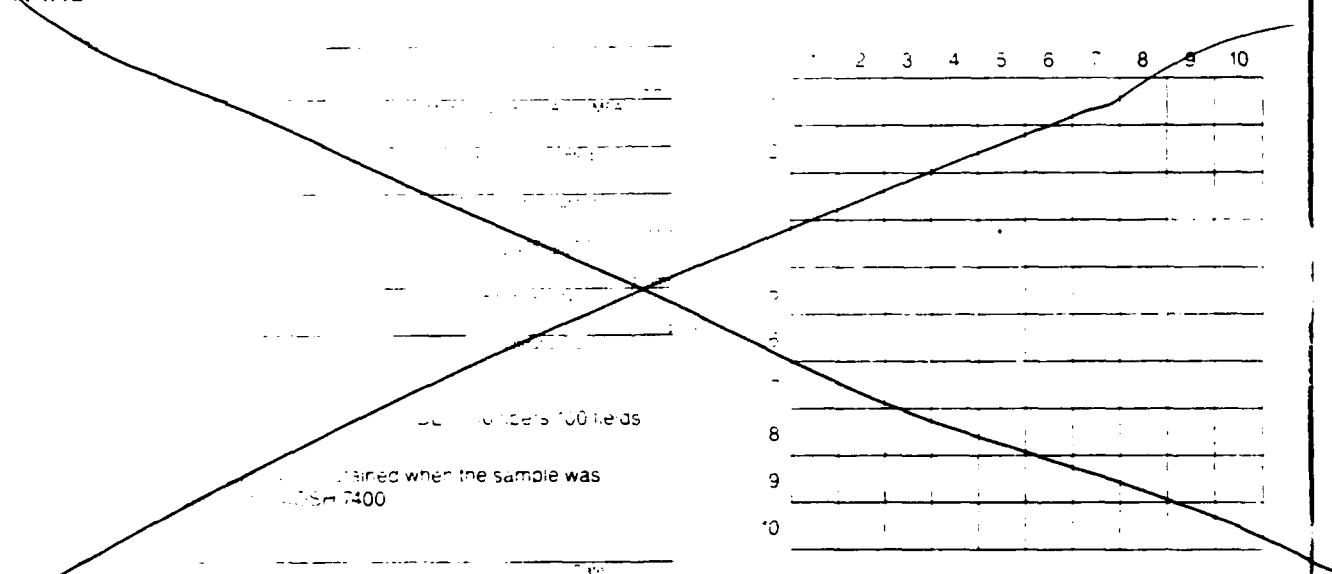
1524

221

L. Nelms

20 Apr. '90

ANAL.



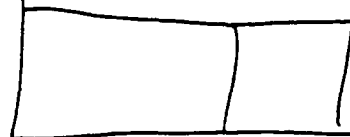
REMARKS

Facility Boarded Up - Could not open.
 Heater did not run continuously
 with MAX Thermostat settings.

TEM
 SW-15-04T

X Dryer Vent

Kitchen



AIR MONITORING DATA

CLIENT Argonne Nat'l Lab ATC PROJECT NUMBER 2104-13-02
 PROJECT LOCATION Swan Sea MA. Unit 15
 WORK AREA ID NO. _____ SAMPLE NO. SW-15-P8

SAMPLE TYPE

PERSONNEL

NAME

DATE

☒ AMBIENT

☐ WORK AREA

☐ ADJACENT ROOM

☐ BACKGROUND

☐ OTHER

☐ CLEAN ROOM

☐ AFD EXHAUST

Field Blank

☐ CLEARANCE

☐ INITIAL

☐ FINAL REOCCUPANCY

☐ OTHER

☐ TWA SAMPLE

(SEE ADDITIONAL SHEETS)

SAMPLE DATA

ANALYST None ☒ X-RE

N/A
N/A

0
None

1138

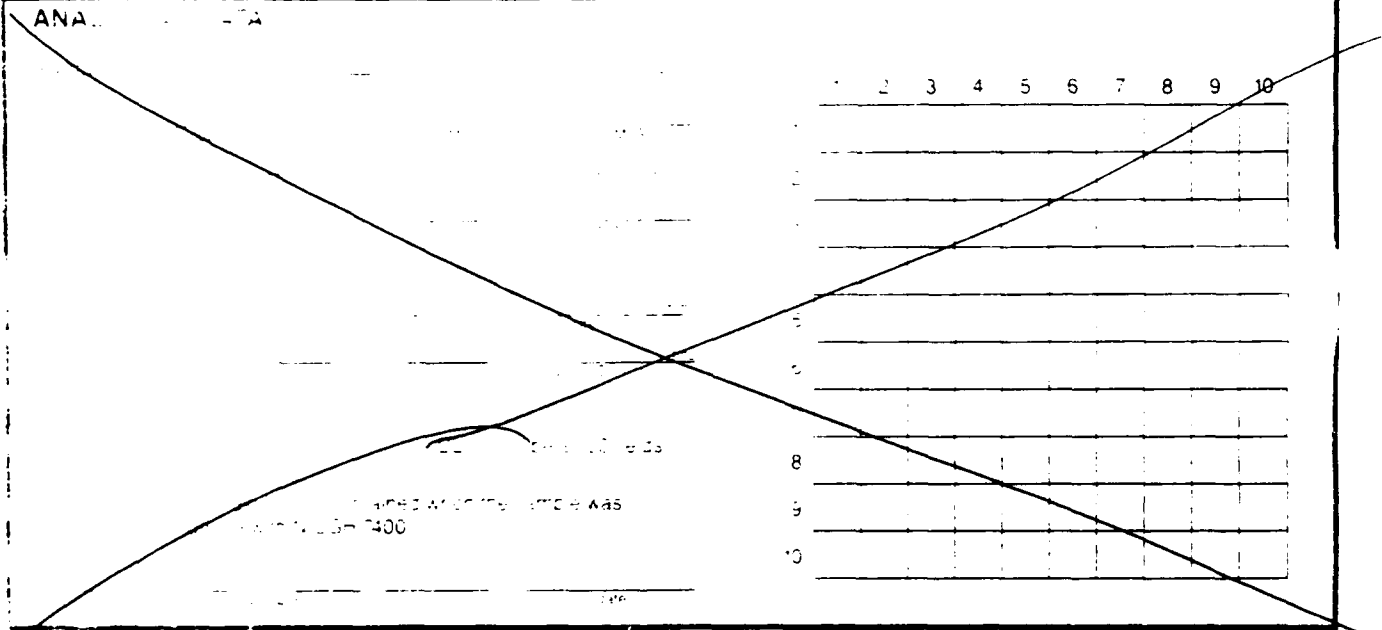
1526

228

L. Nelms

20 Apr. '90

ANALYST



NOTES & REMARKS

TEM

APPENDIX B.2. LABORATORY DATA, AIRBORNE ASBESTOS SAMPLING



ROY F. WESTON, INC.
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PHONE: (205) 826-6100
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TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: SW-15-KI

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EE961

Received by: Barry Rayfield
Analyzed by: Barry Rayfield

Date Received: 04/23/90
Date Analyzed: 04/25/90

Filter Type: 0.45 μ m, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1600.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 6
Total Area Examined: 0.0528 mm²
Detection Limit: 0.00456 fibers/cc
Grid Archive No.: 0226-D-9,10

ANALYTICAL RESULTS

	<u>Chrysotile</u>		<u>Amphiboles</u>		<u>Ambiguous</u>	<u>Non-Asbestos</u>
	<u><5μm</u>	<u>\geq5μm</u>	<u><5μm</u>	<u>\geq5μm</u>		
Number of Fibers Analyzed:	0	0	0	0	0	0
Number of Bundles Analyzed:	0	0	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	0
Number of Matrices Analyzed:	0	0	0	0	0	0

SUMMARY

Concentration of Asbestos Structures < 5 μ m in length: ND (structures/cc)

Concentration of Asbestos Structures \geq 5 μ m in length: ND (structures/cc)

Concentration of Asbestos Structures < 5 μ m in length: ND (structures/mm²)

Concentration of Asbestos Structures \geq 5 μ m in length: ND (structures/mm²)

Total Concentration of Asbestos Structures ND (structures/cc)

Total Concentration of Asbestos Structures ND (structures/mm²)

Comments:


(Approved for Transmittal)

June 14, 1990

(Date)

This test report relates only to the specific items tested.



ROY F. WESTON, INC.
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PHONE: (205) 826-6100
FAX: (205) 826-8232

TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: SW-15-LR

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EE962

Received by: Barry Rayfield
Analyzed by: Barry Rayfield

Date Received: 04/23/90
Date Analyzed: 04/25/90

Filter Type: 0.45 μ m, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1600.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 6
Total Area Examined: 0.0528 mm²
Detection Limit: 0.00456 fibers/cc
Grid Archive No.: 0226-E-8,9

ANALYTICAL RESULTS

	<u>Chrysotile</u>		<u>Amphiboles</u>		Ambiguous	Non-Asbestos
	<5 μ m	\geq 5 μ m	<5 μ m	\geq 5 μ m		
Number of Fibers Analyzed:	0	0	0	0	0	2
Number of Bundles Analyzed:	0	0	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	0
Number of Matrices Analyzed:	0	0	0	0	0	0

SUMMARY

Concentration of Asbestos Structures < 5 μ m in length: ND (structures/cc)

Concentration of Asbestos Structures \geq 5 μ m in length: ND (structures/cc)


Concentration of Asbestos Structures < 5 μ m in length: ND (structures/mm²)

Concentration of Asbestos Structures \geq 5 μ m in length: ND (structures/mm²)

Total Concentration of Asbestos Structures ND (structures/cc)

Total Concentration of Asbestos Structures ND (structures/mm²)

Comments:



(Approved for Transmittal)

June 14, 1990
(Date)

This test report relates only to the specific items tested.



ROY F. WESTON, INC.
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TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: SW-15-BR

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EE963

Received by: Barry Rayfield
Analyzed by: Greg Hall

Date Received: 04/23/90
Date Analyzed: 04/25/90

Filter Type: 0.45 μ m, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1600.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 6
Total Area Examined: 0.0528 mm²
Detection Limit: 0.00456 fibers/cc
Grid Archive No.: 0227-A-2,3


ANALYTICAL RESULTS

	<u>Chrysotile</u>		<u>Amphiboles</u>		<u>Ambiguous</u>	<u>Non-Asbestos</u>
	<u><5μm</u>	<u>\geq5μm</u>	<u><5μm</u>	<u>\geq5μm</u>		
Number of Fibers Analyzed:	0	0	0	0	0	0
Number of Bundles Analyzed:	0	0	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	0
Number of Matrices Analyzed:	0	0	0	0	0	0

SUMMARY

Concentration of Asbestos Structures < 5 μ m in length: ND (structures/cc)
Concentration of Asbestos Structures \geq 5 μ m in length: ND (structures/cc)
Concentration of Asbestos Structures < 5 μ m in length: ND (structures/mm²)
Concentration of Asbestos Structures \geq 5 μ m in length: ND (structures/mm²)
Total Concentration of Asbestos Structures ND (structures/cc)
Total Concentration of Asbestos Structures ND (structures/mm²)

Comments:


(Approved for Transmittal)

June 14, 1990
(Date)

This test report relates only to the specific items tested.



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FAX: (205) 826-8232

TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: SW-15-BA

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: EE964

Received by: Barry Rayfield
Analyzed by: Greg Hall

Date Received: 04/23/90
Date Analyzed: 04/25/90

Filter Type: 0.45 μ m, 25 mm, MEC
Number of Grids Examined: 2
Average Grid Square Area: 0.0088 mm²
Sample Volume: 1600.0 liters
EPA Analysis: AHERA

Filter Area: 385 mm²
Number of Grid Squares Examined: 6
Total Area Examined: 0.0528 mm²
Detection Limit: 0.00456 fibers/cc
Grid Archive No.: 0227-A-4,5

ANALYTICAL RESULTS

	<u>Chrysotile</u>		<u>Amphiboles</u>		Ambiguous	Non-Asbestos
	<5 μ m	\geq 5 μ m	<5 μ m	\geq 5 μ m		
Number of Fibers Analyzed:	0	0	0	0	0	0
Number of Bundles Analyzed:	0	0	0	0	0	0
Number of Clusters Analyzed:	0	0	0	0	0	0
Number of Matrices Analyzed:	0	0	0	0	0	0

SUMMARY

Concentration of Asbestos Structures < 5 μ m in length: ND (structures/cc)

Concentration of Asbestos Structures \geq 5 μ m in length: ND (structures/cc)

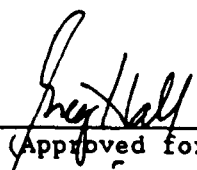
Concentration of Asbestos Structures < 5 μ m in length: ND (structures/mm²)

Concentration of Asbestos Structures \geq 5 μ m in length: ND (structures/mm²)

Total Concentration of Asbestos Structures ND (structures/cc)

Total Concentration of Asbestos Structures ND (structures/mm²)

Comments:


(Approved for Transmittal)

June 14, 1990
(Date)

This test report relates only to the specific items tested.



ROY F. WESTON, INC.
1635 PUMPHREY AVE.
AUBURN, AL 36830
PHONE: (205) 826-6100
FAX: (205) 826-8232

TRANSMISSION ELECTRON MICROSCOPY
ASBESTOS ANALYSIS REPORT

Client: ARGONNE
Client Sample ID: SW-15-KI-DST

Weston W.O. No.: 2104-13-02-0000
Weston Sample ID No.: WG504

Received by: Barry Rayfield
Analyzed by: Beth Hiltbold

Date Received: 04/23/90
Date Analyzed: 04/26/90

Sample Type: DUST WIPE

QUALITATIVE ANALYSIS

A generous loading of dust was collected on a pre-wetted, 25 square centimeter section of a cleanroom wipe. The wipe was placed in a two ounce wide mouth collection vial and returned to the laboratory. Ten to fifteen milliliters of 0.2 micrometer filtered, deionized water was added to suspend the dust. The suspension was ultrasonically dispersed and the coarse fraction was allowed to settle. A drop of the suspension was placed on a Formvar coated 200 mesh Cu TEM grid and allowed to dry. The grid was carbon coated for thermal stability in the electron beam and examined by transmission electron microscopy at 120 kilovolts accelerating voltage.

RESULTS

Chrysotile asbestos was detected. An energy dispersive spectrum (WG504.eds) was recorded.

Barry Rayfield
(Approved for Transmittal)

April 30, 1990
(Date)

This test report relates only to the specific items tested.